

UNITED STATES. PATENT OFFICE.

Thomas H. Macdonald

vs.

Thomas A. Edison

Interference
No. 20,775.
Duplicating
Apparatus.

1900

United States Patent Office.

THOMAS H. MACDONALD

vs.

THOMAS A. EDISON.

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Duplicating Apparatus.

Before the Honorable Examiners-in-Chief.

BRIEF FOR EDISON.

DYER, EDMONDS & DYER,

Attorneys of Record.

FRANK L. DYER,

Of Counsel.

C. G. Burgoyne, Walker and Centre Streets, N. Y.

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Statement.

This is an interference between Edison Patent No. 648,935, dated May 8, 1900 (application filed October 28, 1899), and an application of Macdonald filed June 2, 1900. It appears (Macdonald, Rec., p. 31, x-Q. 50) that the Macdonald application was filed only after his counsel had read the Edison claims in the Official Gazette. Macdonald's course in this respect confirms the position which we shall take in our argument, that whatever may have been done by him towards the development of the invention was in the nature of an unsuccessful and abandoned experiment, which had, apparently, passed out of his mind, and would have remained in innocuous desuetude if Edison had not independently invented and reduced the apparatus to practice.

Edison relies on the filing date of his application (October 28, 1899) as a reduction to practice of the in-

vention. Macdonald alleges conception of the invention in November, 1897, disclosure to others at that time, the making of working drawings in June, 1898, the construction of a full-sized machine between August 1, 1898, and October 1, 1898, and the successful operation of that apparatus on the latter date.

The Invention in Controversy and the Circumstances Leading to Its Production.

Before discussing the relative merits of the cases presented by the two contestants, it should first be explained what the invention is that the parties are here contending for, in doing which we shall try to give the philosophical reason for the making of the invention by Edison.

A phonograph record, as is well known, is formed in a cylindrical waxlike blank by the cutting or gouging action of a curved-edged recording device, which is connected to the diaphragm. If the diaphragm is not vibrated by sound waves, the recorder will merely cut in the blank a spiral groove, the cross-section of which is the arc of a circle. If, however, the diaphragm be vibrated on either side of its medial line, the width and depth of this groove will be obviously increased or diminished as the recorder moves toward or away from the blank. Examined under a microscope, therefore, a phonographic record is found to consist of a series of gouges, which vary in width and depth, and which are connected together, unless, of course, the recording device is vibrated so violently as to actually leave the surface of the blank. Since the record is cut by a curved-edged recorder, it is obvious that the width of these gouges bears always a definite relation to their depth. The length of such gouges depends, however, upon two secondary considerations: first, the extent to which the record surface may be moved during the formation of any particular gouge,

and, second, the rapidity with which the diaphragm may have vibrated. It is evident that, if the record surface be moving very slowly, the curved-edged recorder will be permitted to form a gouge of but slight longitudinal extent; whereas, if the recording surface be moved at a relatively high velocity, a gouge formed by the same vibration will be proportionately elongated. On the other hand, if the vibration is of excessive rapidity (indicative of high pitch), the gouge will be formed so quickly as to be relatively short, even though the speed of the recording surface be high.

In order to reproduce from a phonographic record, a reproducing ball is employed, which is connected to the diaphragm and which is supposed to accurately track the connected gouges constituting the record. These reproducer balls are ordinarily slightly less in diameter than that of the curve of the cutting edge of the recorder. Owing to its spherical form, it is obvious that a reproducer cannot track to the bottom of a record gouge unless the latter be at least as long as it is wide, because otherwise the reproducer would engage the front and back walls of such a gouge and be prevented from fully entering the same.

In practice the pitch of the feed-screw of modern talking machines is .01 of an inch, so that the available width of surface for the formation of the record is extremely narrow. Modern phonographic recorders are generally about .04 of an inch in diameter, so that obviously the record groove, even if of its maximum width (.01 inch), will be very shallow. Any record gouge which is materially less than .01 of an inch, therefore, cannot be tracked by the spherical reproducers, which in practice have a diameter of about .035 of an inch.

When the phonograph was originally invented, it was designed largely as a substitute for stenography, and hence the records as originally made were not loud, and, therefore, neither wide nor deep. Even with

a comparatively slow surface speed of the blank, a record made for dictation purposes would, therefore, be practically free of untrackable gouges or depressions of less length than width. Instead of the phonograph developing along the line indicated, the development proceeded to an enormous extent in the field of entertainment, and most of the talking-machine records sold during the past few years have been musical in character. The original phonograph, as designed as an office amanuensis, made use of listening tubes, but with the advent of musical records it was found necessary to so increase their volume as to permit reproduction by means of a horn. It has, therefore, been the aim of the manufacturers to make louder and louder records, the recording machines being suitably modified to accommodate sounds of greater volume.

The making of very loud musical records presented, however, a greater difficulty than might be supposed. In the first place, a musical record, especially when composite, like that of a brass band or orchestra, is extremely complicated, the number of gouges or depressions as compared to an ordinary talking record being enormously increased and hence relatively shorter, as they must be received on a recording surface of the normal length. In the second place, in order that such musical records may be very loud, the original sounds are of correspondingly greater volume, so that the vibrations of the recording diaphragm will be similarly increased, and, therefore, the depth and width of the gouges or depressions constituting the record will be likewise augmented. Edison found, for example, that with an ordinary phonographic musical record sufficiently loud to be heard through a horn most of the gouges or depressions were of greater width and length. It followed that such records could not be accurately tracked by a reproducing ball, which would be permitted only to glance over the crests of the waves, and hence which would not communicate to the

reproducing diaphragm the full amplitude of the original vibrations. Having made this observation, and having found that the public demand had resulted in the production of a record which could not be tracked by the ordinary reproducing device, Edison turned his attention to the making of a reproducer which could track such a record. Such a reproducer was invented and is described in Edison's Patent No. 652,457, dated June 26, 1900, the application for which was filed September 21, 1899, about a month prior to the application for the patent in interference, both applications pending contemporaneously. The reproducer patent in question, owing to a mistake on the part of the Patent Office, was reissued September 25, 1900, No. 11,857. In this patent Edison points out the difficulties which we have explained, states that he effects a perfect tracking of the record "by the employment of a reproducer of such a form that it will enter all portions of the record as at present made at the usual surface speeds," and claims broadly, in combination with an ordinary loud record phonogram,

"a reproducing device having a curved bearing surface engaging the bottom and side walls of the record and of a form adapted to enter and accurately track all of such representative waves."

Such was the situation in the development along the special line with which we are here dealing when the matter of the invention in controversy was presented.

It is well known that practically all of the phonographic records now sold are duplicates made by a mechanical duplicating process, wherein a reproducer engages a suitable master and communicates its vibrations to an ordinary recorder in engagement with a rotating blank. In this way a single master can reproduce a large number of satisfactory duplicates before it becomes useless, while the first dupli-

cates obtained, being practically as good as the original, can be retained for use as future masters. If a master record is of such a character that portions of its constituent gouges are of less length than width, then it will be obvious that the reproducer ball will not track to the bottom of such gouges, and hence the recorder actuated thereby will not cut into the duplicate to a depth corresponding to that of the master. In other words, the duplicate record will be less in depth than the original record, being so shallow, in fact, as not to contain any gouges of less length than width. Such duplicate records can, therefore, be accurately tracked by a reproducer ball, and the same effect will be obtained from them as would be secured from an original record of greater depth, but which cannot be fully tracked by the reproducer.

So far as regards the ordinary spherical reproducing devices, the usual mechanical duplicating process was all that could be desired, as it resulted in the production of duplicates of as great a volume as can be accurately tracked by such reproducers. When, however, Edison invented the reproducer of his reissue Patent No. 11,857, it was found that the reproduction secured from an original was immeasurably superior to that obtained from a duplicate, owing to the greater depth of the former record which was accurately tracked throughout all portions by the new reproducer. It was, therefore, necessary to make a duplicating apparatus capable of producing duplicate records which shall in all respects of depth and width correspond with a master record. Such is the apparatus involved here in interference.

In his patent in interference Edison says that his object

"is to provide an apparatus for obtaining duplicate phonographic records which shall be equal in volume and quality to an original or master record and, from which in consequence, superior reproductions can be secured, *particularly if the*

reproducing device is of a character to accurately track all portions of the reproduced record,"

i. e., a reproducer as broadly claimed in reissue Patent No. 11,857.

Briefly stated, what the present invention consists of is the provision of a master record of increased diameter, whereby the length of the record groove will be correspondingly increased, so that the gouges or depressions of the record will be spread out and hence will be always of greater length than width, and, therefore, capable of being accurately tracked by the reproducer ball of the duplicating apparatus. The duplicating reproducer ball, in consequence, vibrates to its full amplitude and correspondingly actuates the recorder, which cuts a duplicate record of the full depth, which duplicate can only be accurately tracked by a reproducer of the type for which Edison has been granted a broad patent. For any other kind of reproducer the record possesses practically no greater value than duplicates made from masters of the normal diameter.

We have shown, therefore, that the invention by Edison of the machine in controversy followed a logical line of experiments and is the immediate outcome of the invention by him of a reproducer which he has broadly patented. If Edison had not invented such a reproducer, the principal incentive for the making of the present invention would be absent, since, as we have said, duplicates made with the improved apparatus cannot be tracked any more readily by the ordinary spherical reproducing devices than can the duplicates made by the prior apparatus. Macdonald does not make out any case of intelligent invention, and the production by him of an apparatus involving that invention was not, as with Edison, made for the solution of a single definite problem arising as a necessary consequence from the making of a broad

invention. In fact, as we have said, Macdonald's actions, in our opinion, indicate that whatever may have been done by him must be regarded as an unsuccessful and abandoned experiment of no special importance from his standpoint, which had been practically discarded and would not have been revived if Edison's Patent had not been called to his attention by his counsel.

The issues in interference are Edison's claims 1, 2 and 3, as follows :

"COUNT 1. In an apparatus for reproducing phonograph records, the combination with a mandrel carrying a record of large size, said record being of a sufficiently large diameter as to be free of waves or depressions which are of less length than width, and a second mandrel extending parallel therewith and carrying a blank of smaller size, of means to rotate both mandrels, a reproducer engaging the master record, a recorder engaging the blank, and connections between the reproducer and the recorder.

"COUNT 2. In an apparatus for reproducing phonograph records, the combination with a mandrel carrying a record of large size, said record being of a sufficiently large diameter as to be free of waves or depressions which are of less length than width, and a second mandrel extending parallel therewith and carrying a blank of smaller size, of means to rotate both mandrels at the same shaft speed, a reproducer engaging the master record, a recorder engaging the blank, and connections between the reproducer and the recorder.

"COUNT 3. In an apparatus for reproducing phonograph records the combination with a mandrel carrying a record of large size, said record being of a sufficiently large diameter as to be free of waves or depressions which are of less length than width, and a second mandrel extending parallel therewith and carrying a blank of smaller size, of means to rotate both mandrels at the same shaft speed, a bridge straddling the master, a reproducer pivoted to said bridge, a recorder engaging

the blank, and connections between the reproducer and the recorder."

It may be said, generally, that the only difference between the several counts of the issue and the ordinary mechanical duplicating apparatus which preceded the present inventions resides in the fact that in each count the mandrel carries

"a record of large size, said record being of sufficiently large diameter as to be free of waves or depressions which are of less length than width."

In the Edison Patent in interference it is stated that:

"A record made on a cylinder having a diameter of from five to six inches, and rotated at the usual shaft speed of about 120 turns per minute, will be sufficiently extended as to be practically free from waves or depressions which cannot be accurately tracked to the full depth by a spherical reproducing device."

In the Macdonald application he states that his invention

"consists briefly in the employment, in a suitable duplicating apparatus adapted to carry a blank of standard size, of a master record in or upon which the waves or depressions that constitute the very record of sound are of such comparative length that they may be readily entered, and the record groove truly tracked by the follower or reproducer—in other words, a master on which the record grooves are abnormally extended or lengthened. The length of the waves or depressions must not be less than the diameter of that portion of the reproducer that is to enter them—that is to say, *not less than their width.*"

Taking the statements of both parties and the specific language of the issues into consideration,

there can be no doubt but that the invention for which the parties are here contending is one wherein the master record which is carried on the large mandrel shall be "free of waves or depressions which are of less length than width."

Macdonald's Case.

As against Macdonald, we shall argue :

First, that the specific invention in controversy was never actually reduced to practice by him.

Second, that the apparatus on which he bases his claim for actual reduction to practice was an abandoned experiment.

Third, that he abandoned the invention.

I.

Macdonald testifies :

"In the fall of 1897 I became convinced that it was necessary to obtain better reproduction in order to get better duplicates for commercial purposes. After examination of many of our masters, I was of the opinion that the surface speed was too slow, and that therein lay the chief difficulty. In many of the louder and higher tones I could see the vibrations crowded together so closely as to make it plainly apparent that they were not fully recorded, and even what was there could not be fully reproduced. * * * I made a number of experiments at various speeds to try, if possible, to find a speed that would be the best for all practical purposes. For this purpose I arranged a recording machine so that I could make dictations at a number of speeds varying from the ordinary—that is, about one hundred and twenty revolutions per minute, up to seven or eight hun-

dred. On this machine I made a great many dictations of varying loudness, and listened to the reproductions. My conclusion from this series of experiments was that there was an increase of quality and loudness in the record very noticeable up to a surface speed of about eighteen hundred inches per minute, or somewhere in that neighborhood. Beyond that point I did not think the increase so marked. I became convinced that the reason of the increase in volume and quality was owing to the fact that the recorder was not interfered with in its vibrations by the material behind the heel of the cutter, and also because the reproducer point was able to follow the contour of the waves engraved on the cylinder much more accurately than when they were crowded closely together. * * * I then determined to build a recording machine which would make a record upon the cylinder five inches in diameter, and also a duplicating machine which would carry this five-inch cylinder and duplicate the record upon an ordinary blank" (Macdonald Record, p. 12, Q. 30).

Macdonald testifies that the duplicating machine referred to was completed about the last of August, 1898 (Macdonald Record, p. 8, Q. 8), from sketches made in the same month (p. 9, Q. 13). Photographs of the machine are introduced in evidence. These photographs, as well as the machine itself, show an apparatus employing a large and a small mandrel arranged side by side, rotating at the same shaft speed, with a bridge straddling both of the mandrels, a reproducer engaging the record on the large mandrel and a recorder engaging the blank on the small mandrel, such recorder and reproducer being connected together. This is the machine which Macdonald relies upon as showing a completion of the invention, *but it is to be particularly noted that the apparatus in question does not use, and never did use, the special kind of record which is made a specific element of each count of the issue; namely, one "free of waves or depressions which are of less length than width."*

Macdonald, in fact, was directly asked by his counsel (Q. 24a) :

"Is the Grand record a 'record of sufficiently large diameter as to be free of waves or depressions which are of less length than width,' as called for by the counts of the issue?"

He replied :

"It is not. The *majority of the waves on all Grand records* are of much less length than width. This, of course, is also true of the small record."

Macdonald's attention being called to the statement in his application that with the master record the "length of the waves or depressions must not be * * * less than their width," he was asked if such a description, corresponding as it does to the exact terms of the issue, applied to his original apparatus, and he answered that that would only be "true in a measure," but that with the master as used by him the result "would be two and a half times better than upon the ordinary blank" (Macdonald Record, p. 21, x-Q. 23). Being further asked (x-Q. 24) if the statement in his application that the length of the waves must be "not less than their width" was not inconsistent with his previous answer that the "majority of the waves on all Grand records are of much less length than width," he replied :

"There may be an inconsistency here. It is at best a matter of opinion as to the exact length and comparative length of these waves."

So far as concerns Macdonald's direct and cross examination, it is perfectly clear that he fails to show a reduction to practice of the specific invention of the issue in his original apparatus, but that, on the contrary, he has very definitely shown that with that apparatus some other invention was used. On re-direct

examination Macdonald attempts to bring the original apparatus within the terms of the issue, without directly contradicting his positive previous testimony, by calling attention to the fact that the masters as used by him were five inches in diameter, and we have no doubt that it will be argued by Macdonald that, since Edison refers in his patent to a master "preferably from five to six inches" in diameter, both inventions must be regarded as patentably identical. We reply to such an argument by calling the Examiner's attention to the fact, first, that Macdonald has specifically testified to the effect that the original master used by him was *not* of the character covered by the issue, and, second, that a master five inches in diameter need not have a record free from waves or depressions, less in length than in width, for the reason that, by recording extremely loud or high sounds, the increased surface speed of such a master would fail to result in sufficient elongation of the record as to obviate such objectionable features. In other words, no matter how high the surface speed or how great the diameter of a master record may be, it is still possible to record thereon notes of such great amplitude or high pitch as to make a record which cannot be tracked by a spherical reproducer, and hence which is outside of anything which Edison has claimed in his patent, or which is involved in this controversy. So far as Macdonald's testimony is concerned, such an assumed record is the one which was used by him.

Macdonald supports his case entirely on his own testimony and on the testimony of the witness Osborne. This witness throws no more light on the vital point of the issue than does Macdonald. Osborne states that he has examined "microscopically one of the master records which were used on this machine" (Macdonald Record, p. 37, x-Q. 6), but being pressed for an answer "whether the record was formed of gouges which were of greater length than width, or of less length than width," he was instructed by counsel to decline

to answer the question. The objection to our cross-examination as not being germane, we submit, was not well taken, since the point on which we desired information was an essential feature of the invention in the issue. The witness, having examined microscopically the master records used by Macdonald, was certainly qualified to state whether such records were of the character called for by the issue or something else. His failure to answer the question under instruction from counsel must, we submit, be taken as tantamount to an admission that the records were not of the kind to which the issue is limited. If, in fact, the records which were microscopically examined by Osborne were "free of waves or depressions which are of less length than width," as specified in the issue, we are at a loss to understand why the witness should not have so stated. No other conclusion can be drawn from the refusal of the witness to answer the question than that the answer, if made, would be unfavorable to Macdonald's case. Furthermore, since the testimony of Osborne is silent as to the character of the master used in the apparatus, the witness cannot be regarded in any sense as having corroborated Macdonald on the vital points of the case, even if we disregard Macdonald's express statement that the master used by him was not of the kind called for by the issue, and adopt the argument, which no doubt will be made, that, as his master was five inches in diameter, it must be *assumed* that it possessed the specific limitations of that issue.

We submit, therefore, that Macdonald cannot prevail, first, because he has failed to adequately prove that prior to Edison's application he reduced to practice the specific invention of the issue, and, second, because it follows directly from his own testimony, and by implication from the testimony of Osborne, that the apparatus as originally designed was of an entirely different character from that covered by such issue.

II.

After constructing his original machine in August, 1898, it appears to have been practically dropped by Macdonald. It will be remembered that Macdonald testifies that, while he was working on his original machine, he was also building a recording machine, designed for making the records of large diameter, for use in the duplicating apparatus. Speaking of the recording machine, Macdonald says:

"it made such a sensation and attracted so much of their [the officers of the American Graphophone Company] attention that I received immediate instructions from Mr. Easton, the president and general manager of the Company, to lay aside for the time being all work except the getting out of the Grand machine itself, and the making and selling the Grand machine and Grand records. The work upon the duplicating machine was, therefore, not pressed outside *the laboratory experiments*" (Macdonald, Record, p. 14, x-Q. 1).

So far as the original duplicating apparatus is concerned, *Macdonald alone* testifies that "a number of duplicates were made" (x-Q. 2). In the same answer he says that the machine—

"was then changed, in that the present arm was removed from the machine and another arm substituted for making duplicates by, what I will designate as, the pneumatic process. About forty thousand duplicates were made on this machine by that process; that is, using the five-inch or Grand blank of the master and transmitting the sound waves to the two and three-sixteenths or ordinary blanks; but, as stated in my previous answer, this was some time after the completion of the Grand machine itself, probably six months or possibly eight months later;" *i. e.*, in the summer of 1899 (x-Q. 4).

What the so-called "pneumatic process" was, and why the machine was altered from its original form, are not clear. Macdonald, in answer to re-direct question 12 (Macdonald, Record, p. 34), attempts to describe the pneumatic attachment, but his description is not sufficiently full and clear to enable the construction of that device to be known with absolute certainty. Macdonald does not rely, in support of his claim of reduction to practice, upon the machine as modified by him, but he rests his case solely on the machine *as originally constructed*.

Macdonald's testimony concerning the addition of the pneumatic attachment is entirely uncorroborated. It does not appear that the pneumatic attachment was lost or that it could not have been produced at the time the testimony was taken. His failure to clearly and completely disclose the construction of the so-called pneumatic attachment, or to have his uncertain testimony concerning the same supported by other witnesses, must, we submit, be regarded as an admission that in his opinion the machine as modified was not a reduction to practice. It certainly does not rest with us to cipher out, from the hazy description which Macdonald gives of the modification, the exact meaning which must attach to his words.

After modifying the original apparatus by removing the recording and reproducing devices and substituting the unidentified pneumatic attachment, Macdonald states that the latter device

"was again removed and the original apparatus now on the machine replaced about a month or six weeks ago [*i. e.*, March, 1901], so that the machine is now in the shape it was when originally completed" (Macdonald Record, p. 16, x-Q. 5).

Osborne does not corroborate Macdonald as to the original operation of the machine in its present condition. He says the machine "was tried when completed" (Macdonald Record, p. 36, x-Q. 2). He was asked (x-Q. 3):

" Was the machine at that time actually used for making duplicates, or was it simply operated without a master record and blank ? "

He answered :

" It was tried with the master *blank* and small P blank." .

Of course, if there were a blank on both mandrels, the utility or operativeness of the machine could not be demonstrated. What is needed is a master *record* on the large mandrel and a *blank* on the small mandrel. It is true that Osborne states that he saw the machine in operation at other times for making duplicates (x-Q. 4), but he fails to say when this was (x-Q. 5), and the assumption must be that such successful operation was effected by the machine as subsequently modified by utilizing the pneumatic process therewith.

When the fact is taken into consideration that Edison has a patent, the application for which was filed many months before the Macdonald application, we submit that the nebulous character of Macdonald's proofs must be regarded as indicating an unsuccessful and abandoned experiment. He testifies specifically that the machine as actually constructed and as it now appears was immediately modified by the substitution of the pneumatic attachment, and his statement that the machine was operated in its present form is not corroborated by Osborne. Testimony of this kind, in our opinion, is not sufficiently clear and explicit to support the burden of proof.

A somewhat similar situation was presented in *Wurts vs. Harrington* (C. D., 1897, 20), wherein Wurts sought to overcome the filing date of his opponent's application by proving a single operative apparatus. In that case there was no question but that the original device used by Wurts embodied the issue of the interference, and the existence of that device was proved by no less than three witnesses. The Commissioner said :

"The fact that only one device was made and operated for only a short time, and that it was then laid aside and not used again until other parties were making the device and advertising it extensively, raises the presumption that the use was merely experimental, and that what was done amounted to no more than an abandoned experiment."

In *Putnam vs. Hollander* (C. D., 1881, 246) a single bottle stopper embodying the invention in controversy had been actually used and its successful operation fully proved. Yet the Court held that, as this single device had not been subjected to the test of actual transportation, its use amounted only to an abandoned experiment.

In *Washburn & Moen Mfg. Co. vs. Beat-Em-All Barbed Wire Co.* (C. D., 1892, 299) the Supreme Court held that, since the device was made and afterwards lost, it must be regarded as an abandoned experiment, for, if the maker had considered it of any practical value, he would have applied for a patent on it, as he applied for patents on other devices subsequently.

This is the situation here. Macdonald did not apply for his patent, as we have said, until his counsel had read the Edison claims in the "Gazette," while, after the making of the original machine and before the filing of the application, other applications for patents were filed by him (McDonald Record, p. 31, x-Q. 49).

See, also, *Deering vs. Winona Harvester Works*, C. D., 1894, 672.

In the several cases to which we have referred there was no question but that the prior device embodied the invention in controversy, and its substantial operativeness was in each case conclusively established. In the present contest Macdonald admits that his original apparatus did not contain the invention of the issue, and, even if such were not the case, the operativeness of that apparatus has not been proved.

A case on all-fours with the present situation, though not so strong, since the application of the junior party was filed *prior* to the issue of the patent to his opponent, is *Glidden vs. Busell* (C. D., 1894, 48). In that case Glidden relied entirely on a machine constructed by him in 1886. This machine was sufficiently operative to trim and rand a few heels, and was, in fact, so used. It was, however, dismantled, and experiments with other forms of driving mechanism were carried on. It was only after the interference was declared that the original machine was reassembled, and the attempt was made to support a claim of actual reduction to practice thereon. After reviewing all the circumstances of the case, the Commissioner held, however, that Glidden's early work must be regarded as an abandoned experiment.

The similarity between that case and the present one is striking. Both Glidden and Macdonald constructed an original machine. Glidden's device was operative in a measure. Macdonald says that his device worked, but his testimony is uncorroborated. Both Glidden and Macdonald, after making their original machines, commenced experiments in other lines. Glidden ultimately achieved success, in which respect Macdonald's proofs are lacking. Finally, both Glidden and Macdonald reassembled their original apparatus, and Glidden sought, as Macdonald now seeks, to support a claim of actual reduction to practice thereon. If in the former case Glidden's early machine was regarded as an abandoned experiment, we submit that in the present case Macdonald's original apparatus should be so considered.

On appeal to the Court of Appeals (C. D. 1895, 273) it was held that, although the original Glidden machine trimmed a few heels, it "would not operate continuously and successfully," and that, therefore, "the machine of Glidden was inoperative and practically a failure."

III.

We have pointed out the line of the development of the invention by Edison, and have shown that the present apparatus was the logical outcome of the invention by him of a reproducer which for the first time in the art was capable of accurately tracking all portions of a phonograph record of standard diameter and sufficiently loud to be heard through a horn. Edison's Patent in interference clearly states the theory upon which the present invention is based—*i. e.*, the utilization of a master having such an extended record as can be tracked by a spherical reproducer, so that the resulting duplicates will correspond, in depth and width of the gouges constituting the record, with an original record made on a blank of standard diameter. Since Edison was the first to make a reproducer which can track a duplicate of the kind made by the present apparatus, the question naturally arises: What was Macdonald's purpose in making an invention for the production of duplicates which could not be tracked by any reproducer known to him at the time? Macdonald's explanation is not particularly convincing. He says that he wished to make a master taken at high surface speed, because by doing so a more perfect record would be formed. Thus, in answer to x-Q. 26 (Macdonald Record, p. 22), he says:

"This high or increased speed carries the material under or behind the heel of the cutter away, so that, in the downward movement, the cutter is not intererred with by this material; consequently, the cut results in a more accurate sound wave."

In his application, filed December 5th, 1898, on the so-called Graphophone Grand, Macdonald makes the statement:

"The present invention involves the principle which may be briefly stated as follows: The speed imparted to the record tablet should be such that the crest of each undulation moves from under the record and recording style so rapidly that the heel of the latter at no time makes contact with the recording material; and that the diaphragm is free to give its full sweep. The invention, therefore, consists primarily in imparting to the tablet during the recording operation a surface speed which will secure the result above stated. It has been found that a surface speed of about forty-four meters per minute will secure the desired operation."

Macdonald still agrees with this statement (p. 29, x-Q. 46). Furthermore, Macdonald, in an affidavit filed in the same application on the Graphophone Grand, referring to himself in the third person, said

"that, from his intimate knowledge of the art, he has no hesitation in asserting that, in making records by and in accordance with his said invention described in his said application, the recording surface travels at such a high speed as to withdraw the crest of each undulation from under the heel of the recording style before the same has damped or checked the vibration of the style; in other words, that the surface of the recording tablet moves relative to the style with a high surface speed sufficient to prevent the heel of the style from making contact with the undulations; furthermore, deponent says that, from his knowledge of the art, he confidently asserts as a reason why sound records cut in wax, or waxlike material, as the same were produced prior to his said invention, did not give reproduction sensibly equal in volume and corresponding in character to the original sounds, is that the surface of the recording tablet moved under the recording style with a speed so slow that the heel of the style made contact with the undulations, thereby damping vibrations of the style and diaphragm, and necessarily causing the style to cut undulations not only of less amplitude, but materially

differing in character from the original sound wave."

Asked (p. 31, x-Q. 47) if he still agreed with these statements, he replied :

" I cannot identify this particular affidavit, but will state that I believe the substance of what is stated is correct—that is, the heel of the cutter is interfered with at slow speed, and this has the effect of producing a record of less volume than where the speed is higher."

Having reference to Macdonald's pretended theory, that phonographic records as heretofore made on blanks of standard diameter were imperfect because the surface speed was not sufficiently high to prevent heeling, he was asked (p. 24, x-Q. 29) :

" Were you the first, so far as you know, to suggest this possible difficulty in recording sounds, and to explain the way by which that difficulty could be overcome ? "

He replied :

" I believe that I was the first to suggest a way by which this difficulty could be overcome. I might say I believe myself to be the first to have recognized this as the difficulty in the way, and to suggest the means of overcoming it in this type of machine ; that is, a five-inch blank at a high surface speed."

Macdonald's reference to the use of a master of abnormally large *diameter* is obviously inconsequential, since in his Graphophone Grand application of December 5th, 1898, he says that a high surface speed is alone necessary, and the Examiner will find, upon reading that application, that Macdonald specifically refers to the securing of a high surface speed by the operation of a standard blank at an abnormally high

shaft speed, as well as by the use of a blank of large diameter.

We have referred to Macdonald's pretended theory in this case solely for the purpose of showing that that theory is inconsistent with his present attitude—*i. e.*, that he conceived and reduced to practice the invention here in controversy, which is based upon Edison's discovery of the true difficulty. The invention in controversy is described by both parties as depending solely upon the supposition that the master must be of such a character as will permit the record thereon to be accurately tracked by the reproducer ball. That is the theory which Macdonald has adopted in his application, and is one in which he has taken bodily from the Edison Patent.

Macdonald's theory in reference to the *making* of the record is outside of the case and one which Edison does not adopt. Anyone skilled in the art must know that a recording surface should be moved at a sufficiently high speed as to prevent the heel of the recorder from striking the crest of the wave. That speed depends absolutely upon the amplitude and rapidity with which the diaphragm vibrates. If a diaphragm vibrates with great rapidity, a higher surface speed must be imparted to the recording surface to prevent heeling than if it vibrated with less rapidity. Macdonald himself admits that this is theoretically true (Macdonald, Record, p. 22, x-Q. 27). Edison, and we presume all other skilled persons, knew this years ago. For example, Edison's Patent No. 393,968 dated December 4, 1888, states :

"It might be supposed that a cutting tool would be unsuitable for the recording point, and that the heel of the tool would strike the bottom of the groove and prevent the formation of a perfect record or obliterate the record as made by smoothing or pressing out the indentations more or less ; but I have found that the movement of the recording surface is sufficient to keep the heel of the

tool clear of the indentations" (p. 1, lines 45 to 58. See, also, Edison Patent 393,967 of the same date).

So far as concerns Macdonald's theory as to "heeling" in the formation of the record, we assert without hesitation that it is without basis, and that the true cause for imperfect reproduction in a duplicating apparatus is that which Macdonald has now adopted in his application in interference, and which Edison fully explains in his patent here involved—*i. e.*, that sound waves formed on records at slow speed are, when loud enough to be heard through the horn, of such a form that they cannot be accurately tracked by a spherical reproducer. The heeling to which Macdonald refers is not even experienced when records are formed at the ordinary and usual surface speeds.

Having referred to his pretended theory of heeling, for which in practice there is no basis, Macdonald states that he obtains a more perfect master, and secures, in consequence, more perfect duplicates therefrom. Thus, he says (Macdonald, Record, p. 21, x-Q. 23) :

"There are, I believe, many sound waves which are recorded and which can be reproduced well by the reproducers simply touching the crest of the record without fully entering the groove. I believe that it is not so much in the reproducing as it is in the recording. The great improvement, in my opinion, is in the fact that the rapidly-moving surface of the Grand blank permits a much more nearly perfect record wave to be inscribed thereon, and that, once we have a perfect negative or record, we obtain necessarily much better duplicates."

From Macdonald's point of view, we submit that such a result for duplicating purposes is impossible. If it be admitted that the reproducer in engagement with the large master tracks to a greater depth than would be the case if it engaged a small master, so that the

resulting duplicate will be deeper in the former than in the latter case, Macdonald would secure a duplicate which, on his own admission, could not be tracked by a spherical reproducer, because he says, in the answer above quoted, that such a reproducer would not accurately track even the record of the large master itself. On the other hand, as we have before said, with the ordinary duplicating apparatus using a master of standard diameter, the record of which is not tracked to the full depth by the reproducer, the recorder will cut in the duplicate a record the depth of which corresponds in extent to the amplitude of vibration of the reproducer, and such a duplicate would be, therefore, just as effective for the ordinary reproducer as would be a duplicate made from a master of large diameter. Macdonald practically admits this :

" x-Q. 38. Did you ever compare an original standard record made at the usual surface speed with a duplicate record made from a five-inch master, so far as quality and other desirable characteristics are concerned ?

" A. I have.

" x-Q. 39. How did they compare ?

" A. The duplicates are not so good, but they are better than duplicates made from an ordinary blank.

" x-Q. 40. In what respects are these duplicates inferior to original standard records ?

" A. I think there is a loss in that vague something which we call quality, and, also, in loudness in some portions of the record ; though some of the sounds seem to be recorded sometimes even louder than an original. In general I would say there is a difference in loudness and quality as compared with an original standard record " (Macdonald, Record, p. 27).

Thus, Macdonald expresses the opinion that a duplicated made by the apparatus of the issue is not so good as an original standard record, but is somewhat better than a duplicate made from a standard-sized master.

When the fact is recalled that the latter duplicates can hardly be distinguished from the original masters, it will be seen that whatever advantages Macdonald may have secured by the present duplicating machine, were, on his own admission, extremely small. It was not until Edison invented his new reproducer that the advantage of such a machine became apparent. We have no doubt that this was the reason which impelled Macdonald to his course of inaction. In other words, with the ordinary reproducer he saw nothing in it.

Furthermore, we direct attention to the fact that if Macdonald believed in his theory of heeling and that such action prevented the formation of an accurate record, he must have seen that this objection would be met in the formation of a duplicate to as great an extent as in the formation of an original, since it was his object to make a duplicate which would correspond as closely as possible to an original. This may have been an additional reason for inaction on his part. It does not, however, rest with us to explain his motives or actions. It is sufficient only to say that the early machine which Macdonald made did not, on his own admission, contain the invention of the issue, nor does it appear from anything in the testimony that he even had a conception of such an invention prior to the filing of his present application, which appropriates bodily the theories advanced by Edison. If Macdonald's theories were made the basis of his application, it is apparent that the claims of the issue could not have been properly supported by the same. Whatever may have been the reason for Macdonald's failure to do anything with his machine as it now stands and as originally constructed, the fact remains, from his own statement, that immediately after the machine was constructed, it was changed by the substitution of the pneumatic attachment, and was only returned to its original condition a short time previous to the taking of his testimony. It is true that Macdonald states (Macdonald Record, p. 16, x-Q.

6) that he built a second machine in the fall of 1899, but the latter device is not produced, nor is it adequately described; furthermore, such construction was subsequent to the filing of the Edison application. After the original machine was constructed, nothing, so far as the proofs go, was done with it, since Macdonald's testimony as to its operativeness in its original condition is not corroborated. It was not until the Edison Patent had issued that Macdonald's interest in the apparatus was aroused, and his application was filed, based, as we have before said, on Edison's theory and in utter defiance of the theories which Macdonald elaborated in his Graphophone Grand application of 1898, and which he still pretends to believe in. He gives no explanation of his failure to file an application for a patent at an earlier date. He states (p. 16, x-Q. 8) that all of his patentable ideas

"are submitted to the president of the Company, Mr. Easton, and the patent counsel, Mr. Mauro, and their decision is the controlling factor in the matter;"

that he did not urge upon those gentlemen the necessity of filing the application (x-Q. 10); that he does not know why the application was not before filed (x-Q. 11); that neither Mr. Easton nor Mr. Mauro gave him any reason for their failure to file an application (x-Q. 12); that the American Graphophone Company, his assignee, was financially able to file the application at any time (x-Q. 14); and that between the making of his original machine and May, 1900, patent applications were filed in his name on other inventions.

We submit that when all the facts are taken into consideration it must be admitted that Macdonald's interest in what may have been originally done by him was extremely slight. He does not seem to have cared anything about the apparatus even to the extent of ascertaining whether an application had been filed. Nothing, we submit, can

more clearly point to an actual relinquishment of an invention, if practical cessation of all interest therein amounts to abandonment. If we have convinced the Examiner that from Macdonald's point of view duplicates made by him were without special utility, and this seems to have been the case, a most excellent reason is furnished why that invention should have been abandoned by him. At any rate, Macdonald has not shown the unremitting efforts which usually characterize the work of inventors in the development of their devices, and we feel safe in asserting that his case as made out by him is not of a character sufficient to overcome all the presumptions of originality and validity which must attach to Edison's Patent.

The general rule of law applicable to an interference like the present, between a patent and an application filed after the grant of the patent, is that the degree of proof furnished by the applicant must be sufficient to overcome the patent if urged as a defense in a suit based thereon (*Deprez & Carpentier vs. Bernstein*, 54 O. G., 711), and it must indicate prior invention on the part of the applicant beyond a reasonable doubt.

Hansen vs. Davis, 55 G. G., 998.

Hunter vs. Jenkin, 56 O. G., 1705.

Weston vs. Richardson, 57 O. G., 1425.

Hunter vs. Van Depoele, 57 O. G., 1720.

Dillon vs. Kimball & Wirt, 58 O. G., 384.

La Flare vs. Chase, 72 O. G., 741.

As stated by the Court of Appeals in *Doyle vs. McRoberts*, C. D., 1897, 413:

"As between the parties to the present controversy, McRoberts only has received a patent, and this, on its face, affords *prima facie* evidence that he is the inventor, and that the thing patented is a novelty, and the patentee will not be defeated of his rights under the grant unless the applicant shall establish the priority of his invention beyond a reasonable doubt."

In the present case we have only the testimony of Macdonald that his original machine was operative; yet he gives no explanation as to why the machine should have been changed. Since the machine as changed is not relied upon as a reduction to practice, it must be assumed that, in its modified condition, it did not embody the invention of the issue. The making of a single machine, the operativeness of which is not established, and which on Macdonald's admission was immediately changed, cannot, we assert confidently, be regarded as such an adequate proof of prior invention as should, beyond a reasonable doubt, be considered as sufficient to overcome the Edison patent. Proof of this kind, if urged in a suit based on that patent, would, we believe, receive but scant consideration by the Courts.

The Decision of the Examiner of Interferences.

The Examiner of Interferences bases his decision in Edison's favor on the failure of Macdonald's proof in this respect. As regards our contention that the testimony does not show that the original machine embodied the invention of the issue, the Examiner considered it unnecessary "to discuss this point at length in view of the conclusion above arrived at." Concerning the operation of his original machine, Macdonald says that

"It was tried immediately upon completion, and it was used at frequent intervals in the laboratory for several months succeeding its completion (Macdonald, Record, p. 12, Q. 27).

"The machine * * * was used in the laboratory and a number of duplicates were made" (p. 15, x-Q. 2).

Osborne states that the machine "was tried when completed" (p. 36, x-Q. 2), and that he "saw it in

operation several different times in another department" (x-Q. 5).

After referring to this testimony, the Examiner said that

"it is at least a question whether he states anywhere in his deposition directly and unequivocally that he ever saw a duplicate made on the machine. Much less does he state what the character of the product of the operation of the machine was. And it may be said generally that both Macdonald and Osborne fail to testify directly that the machine produced duplicates useful, commercially or otherwise. In other words, the record fails to establish that the machine operated successfully. The circumstances in this case analogous to those in *Burr v. Ford & Ferguson*, 70 O. G., 275, and, as the Examiner believes, the language of the Court in that case applies to the facts in this with even more force than to the facts in the case cited. In both cases the senior party was in possession of a patent granted prior to the filing of the junior party's application. In the case cited the established use of the lug or coupling was experimental. In the present case the machine 'was used in the laboratory.' In the case cited the article was of such a simple nature that it might almost be said that one should be able to determine from inspection alone as to its operativeness, and though the couplings were tested by being fitted to a wooden block and to an empty tank, the Court held that 'It was shown in the evidence that the pressure upon the lugs when enclosing a filled tank is very great and very different from that which is exerted by screwing up the connecting tap,' and since Burr had failed to show that the device was operative, and operated in the position and under the circumstances for which it was designed, he, the junior party, had failed to establish his case. If in regard to so simple a device at that in the case cited, the Court required definite and unmistakable proof of successful operation, how much more should be required in reference to a machine of many parts and delicate in its method of operation. The following language also applies

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to the present case: 'The burden of proof imposed upon appellant to make out his case in a clear and satisfactory manner, coupled with his long and unexplained delay in applying for a patent for this useful and valuable invention, made it incumbent upon him to exhaust all reasonable means within easy reach to prove the reduction of his invention to practice. It appears that he was not without means; that he was a practical business man, as well as an inventor; that he was to some extent informed with regard to the practice of the Patent Office, for he had twice before made applications for patents upon his inventions.' This holding of the Court, so far as the Examiner understands, has not since been modified, nor has the strict rule there laid down been relaxed; for in the late case of *Sharer v. McHenry*, 98 O. G., 585, the Court used this language: 'This rule in respect of the conclusive weight of evidence necessary to overcome the priority of invention evidenced by a regular and formal patent has been long established, and observation of its operation in general has had no tendency to incline us toward laxity in its application.' "

Conclusion.

The decision of the Examiner of Interferences should be affirmed.

Respectfully submitted,

FRANK L. DYER,

Of Counsel for Edison.

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